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Benefits of Wind Power

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New England Regional Wind Power Issues Workshop
Wind Powering America
Boston, MA
October 25, 2001





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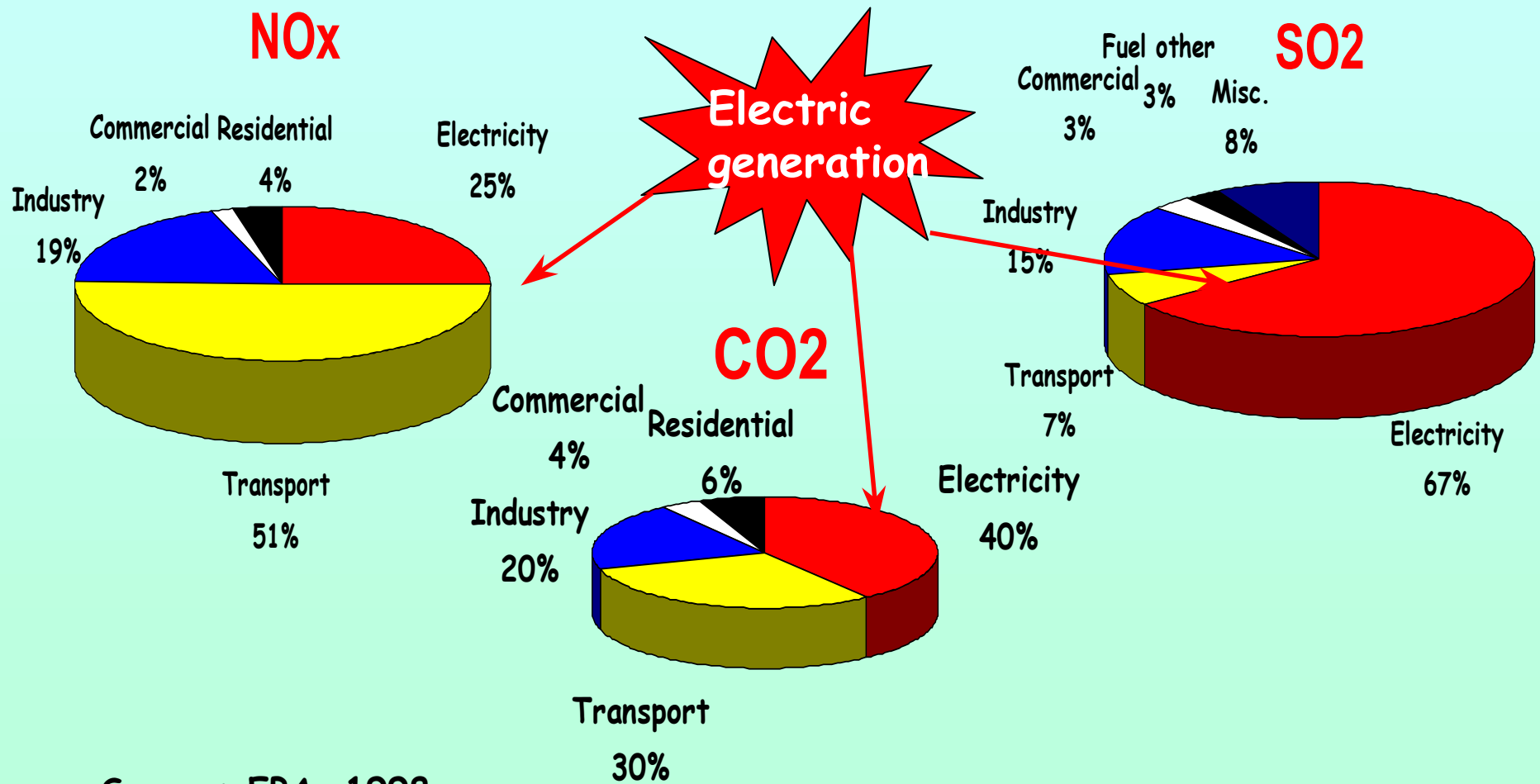
The benefits are shared... **Regional and national benefits**

- ⌘ **Environment**
- ⌘ **Consumers**
- ⌘ **Employment and income**
- ⌘ **Security**



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Electricity is a Major Contributor to Air Pollution



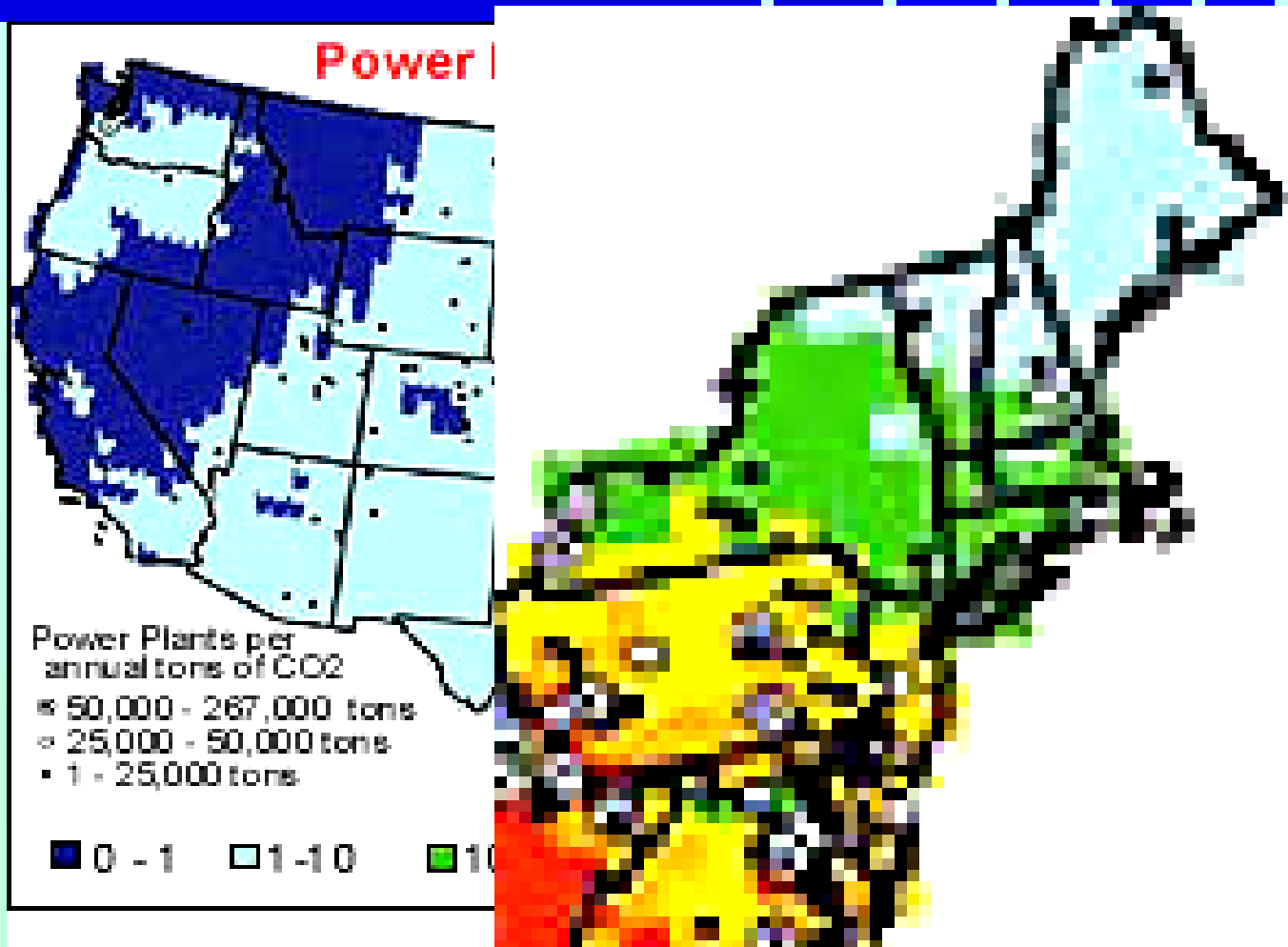
Source: EPA, 1998



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Environmental benefits

Air pollution harms human health



✦ ~30,000 early U.S. deaths each year from power plant particulates

Smog impacts (all sources):

- ✦ 6.2 million asthma attacks
- ✦ 117,300 ER visits
- ✦ 58,600 hospital admissions

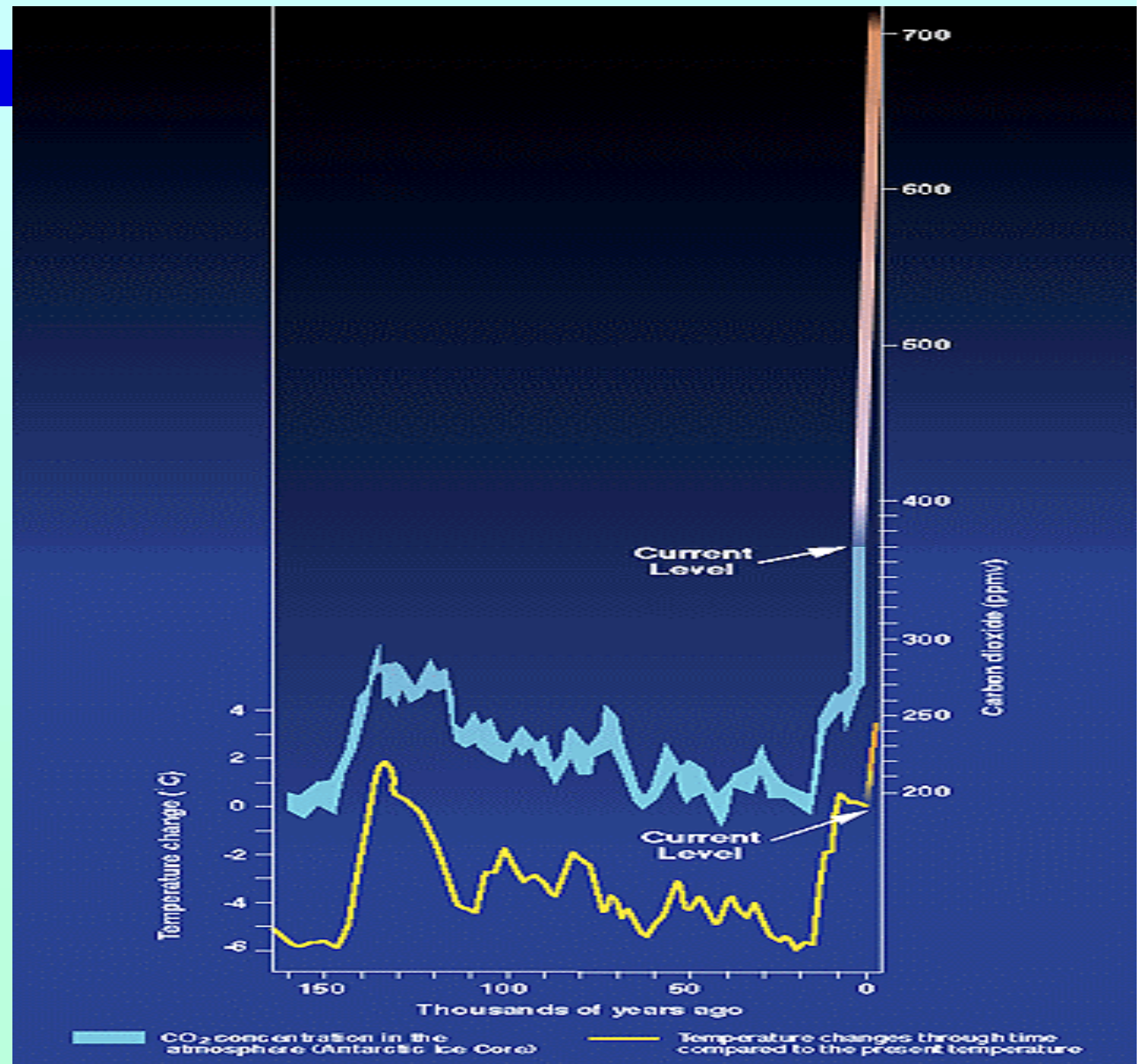


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Environmental benefits **Threat of global warming**

160,000 year
correlation between
CO₂ and global
temperature...

...and the next 100
years! (projected)





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Environmental benefits **Edgartown, Martha's Vineyard** approximation of 1 meter sea-level rise



Edgartown today



Edgartown - 1 meter rise

(expected around middle of 22nd century)

+ storm surge after hurricane

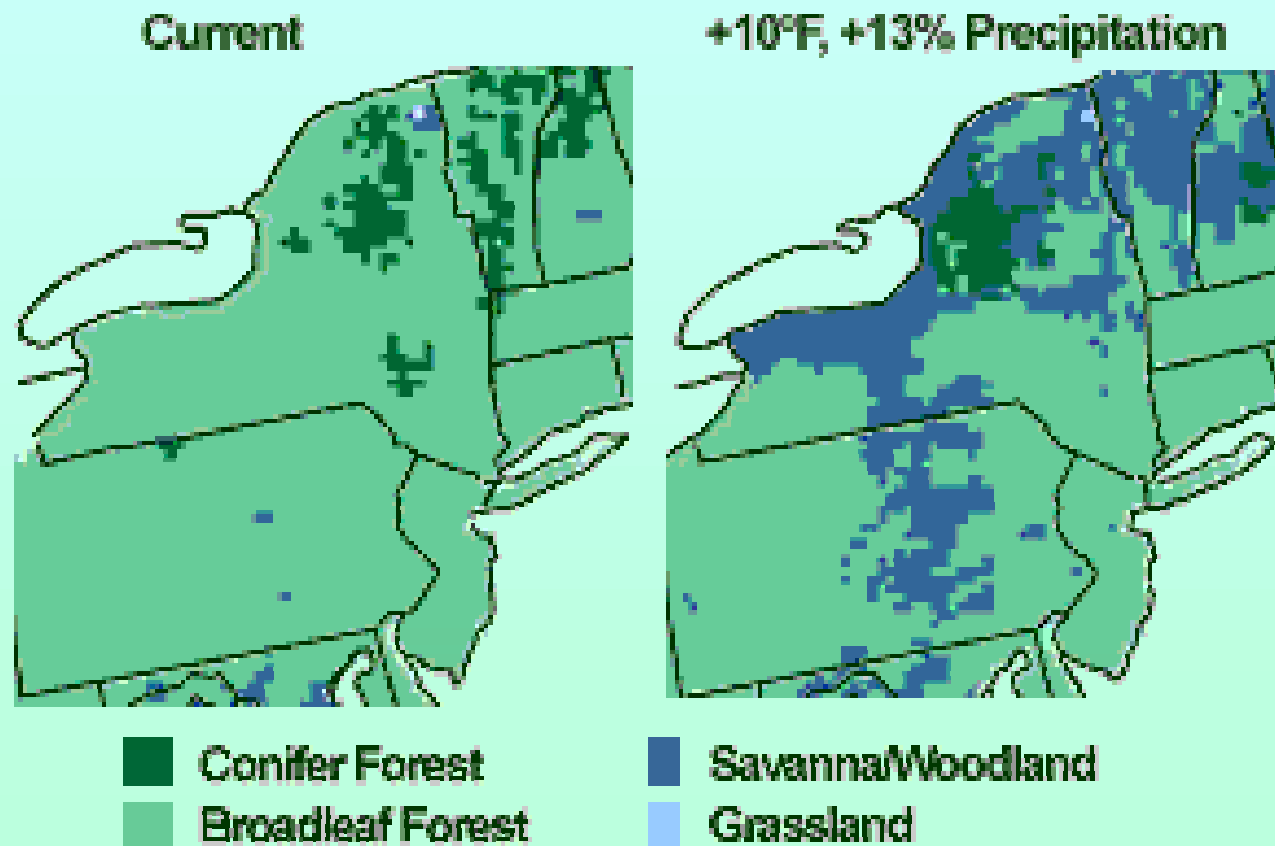
Source: National Environmental Trust



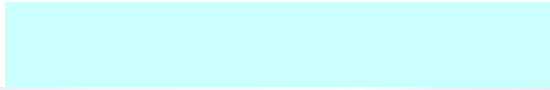
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Environmental benefits

Northeast forest - significant changes to forest species



Source: VEMAP Participants (1995); Neilson (1995).



Searsburg, Vermont





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Environmental benefits

Mountaintop removal coal mining

- ✦ 15-25% of southern WV mountain tops removed
- ✦ 300,000 acres of forests
- ✦ 1,000 miles of streams buried



Source: Citizens Coal Council

<http://www.citizenscoalcouncil.org/mtr.htm>



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Environmental benefits

Big Sandy River, KY mine waste spill



- ✦ 250 million gallon spill
- ✦ 75 miles of streams contaminated
- ✦ Arsenic, mercury, lead, copper, chromium



Source: Southern Alliance for Clean Energy
<http://www.tngreen.com/cleanenergy/energy/coal/KYdisaster/index.html>

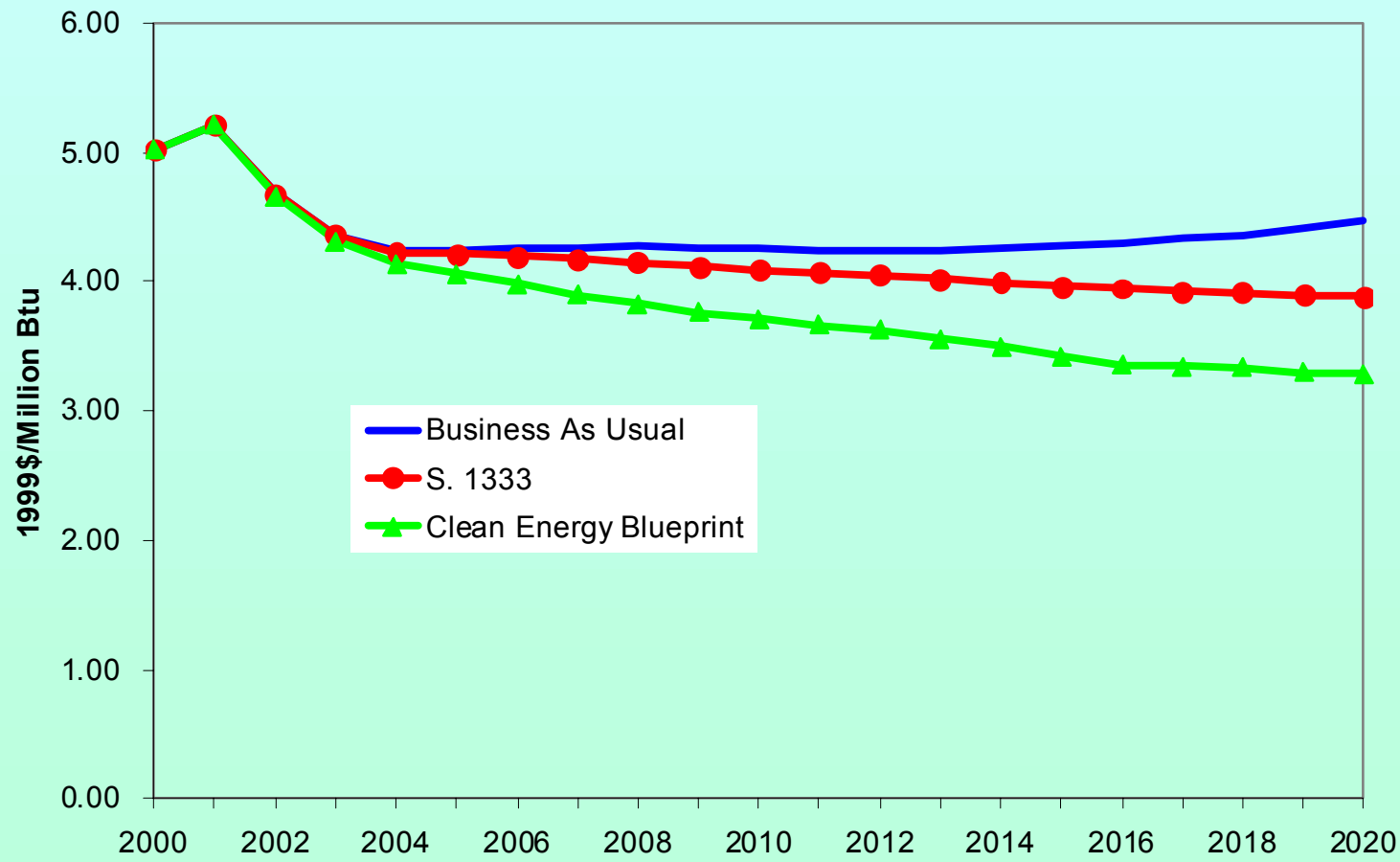


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Consumer benefits

Natural gas price projections

Business as usual vs. S. 1333 and Blueprint



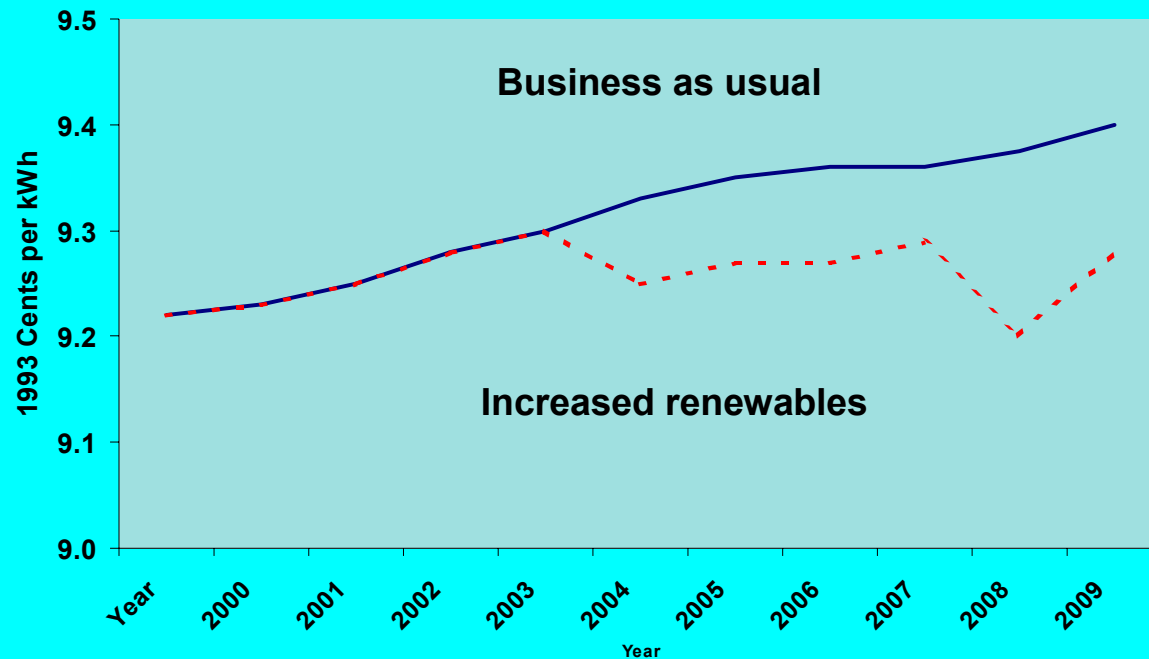


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N.E. renewables can reduce electricity prices

Consumer benefits

Average Electricity Prices



Source: Assessing New England's Energy Future, New England Governors' Conference, December 11, 1996, p. V-6

* Renewables =
50% of new
generation

* Assumes gas
increases to
25% of
generation by
2010

* Gas projected
by some to
equal 50-67%
of generation by
2003



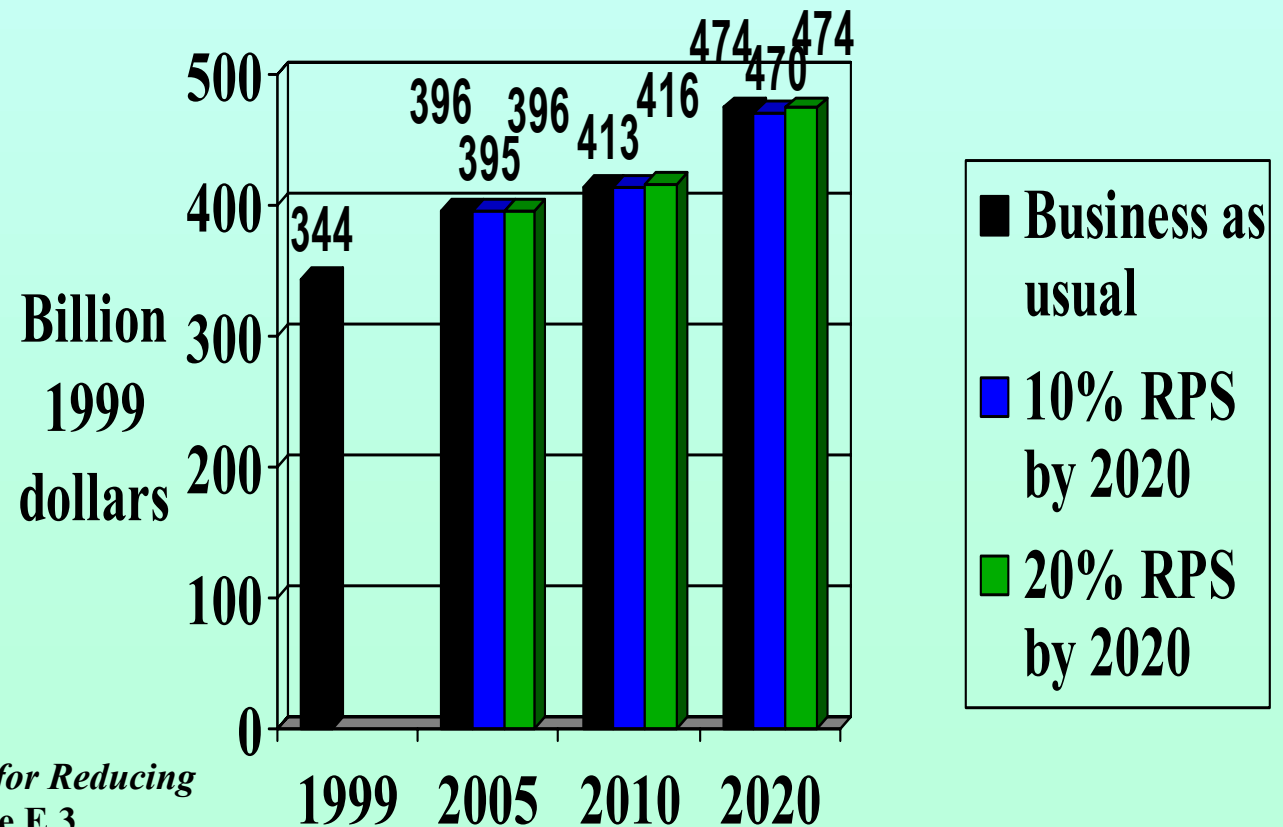
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EIA: RPS cost including gas savings

Consumer benefits

- ⊕ High wind costs compared to EPRI/DOE
- ⊕ Artificial limits on wind ramp up
- ⊕ Limits wind regional penetration to 15%
- ⊕ Renewables premium up to 5 cents/kWh

US Total Residential, Commercial & Industrial
Energy Bills



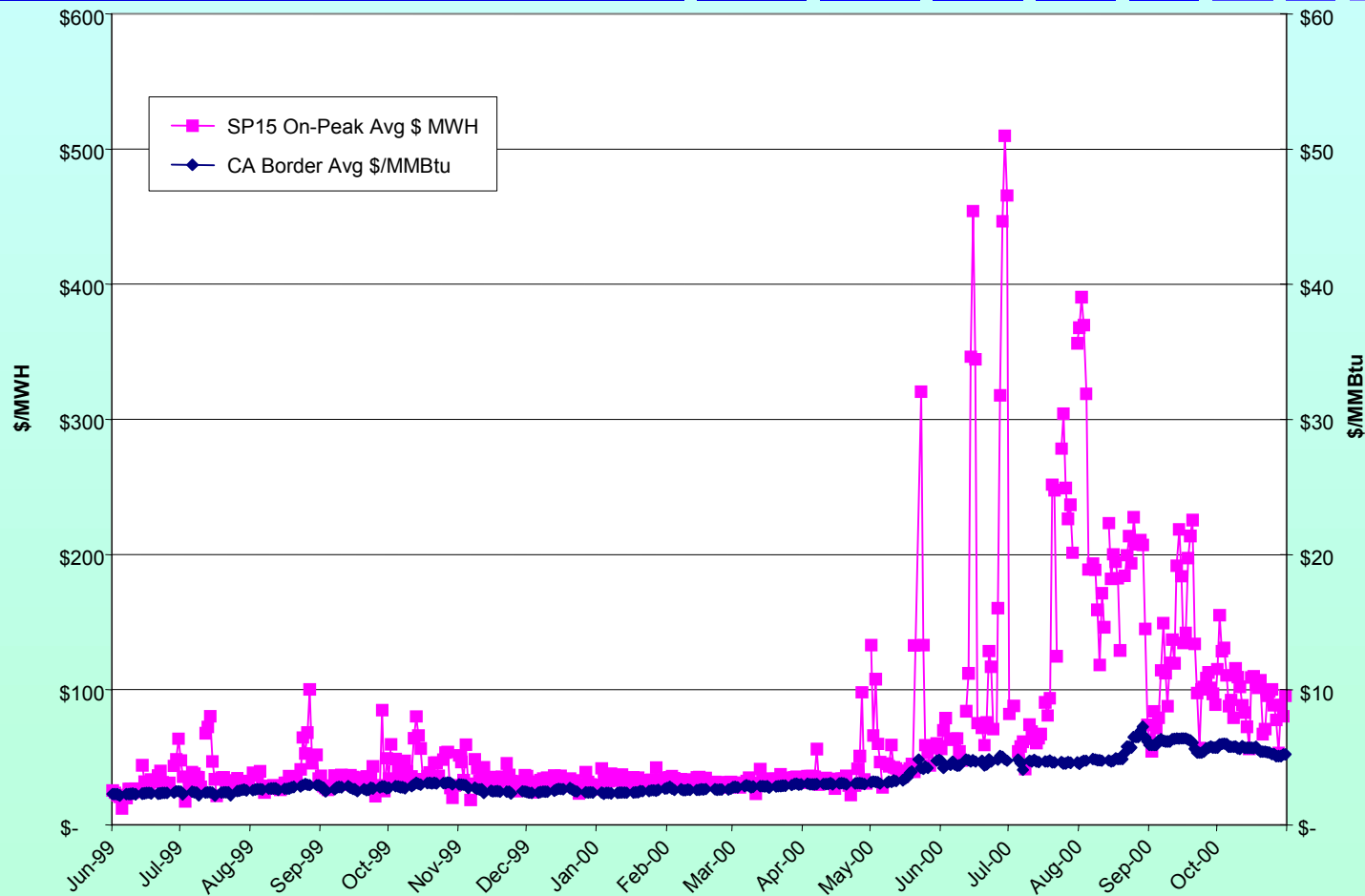
Source: EIA, *Analysis of Strategies for Reducing Multiple Emissions*, July 2001, Table E 3



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Consumer benefits

California electricity prices disconnect from natural gas prices



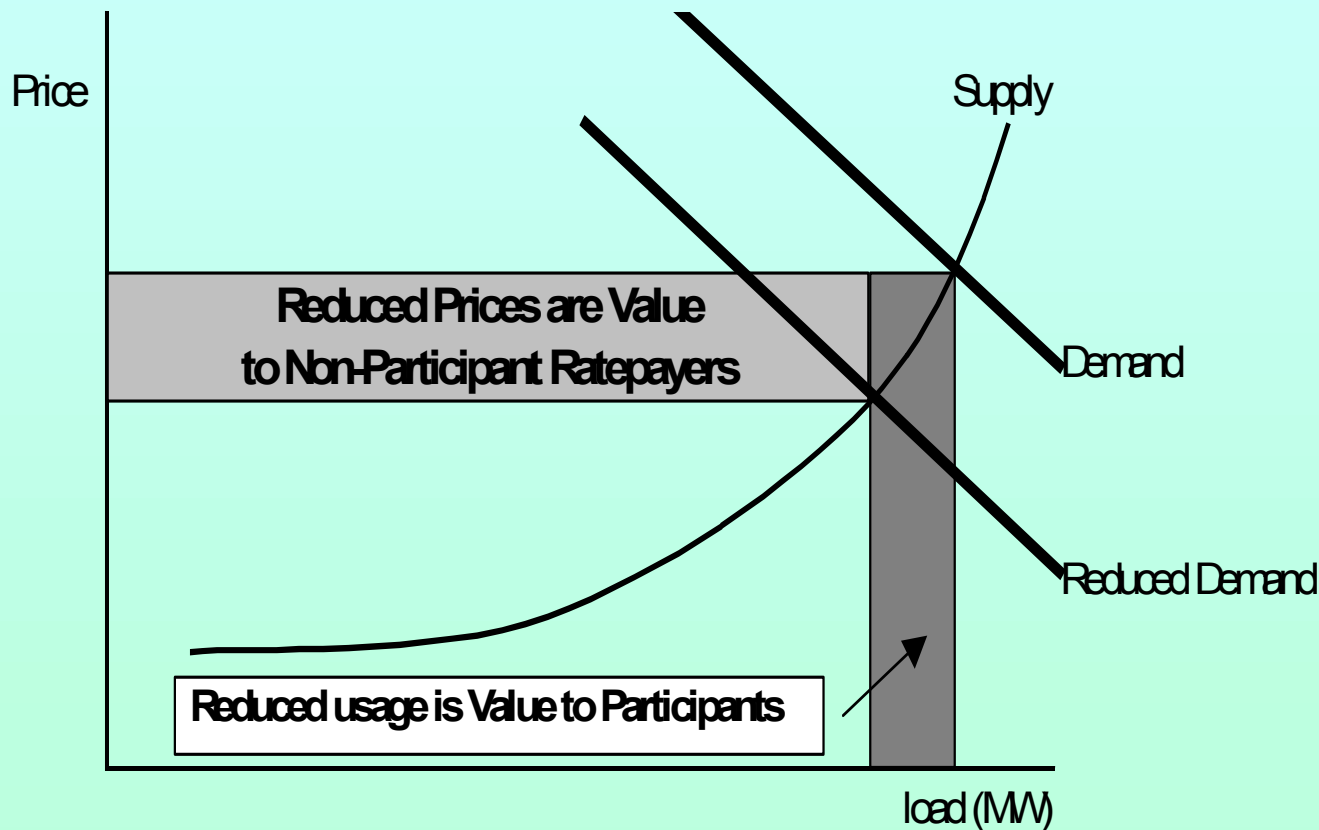
Source: Edison International



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Consumer benefits

Load reduction reduces prices to all spot market customers



⊕ **Load reduction worth 2x (off-peak) to 5x (on-peak) as much as market price**

Source: Bill Marcus, JBS Energy



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Renewables and efficiency Clean Energy Blueprint

- ⌘ Renewable portfolio standard
- ⌘ Investment tax credits
- ⌘ Net metering
- ⌘ Energy efficiency and renewables R&D
- ⌘ Public benefit fund - \$1/month
- ⌘ Efficiency standards and building codes
- ⌘ Efficiency tax incentives
- ⌘ Combined heat and power incentive

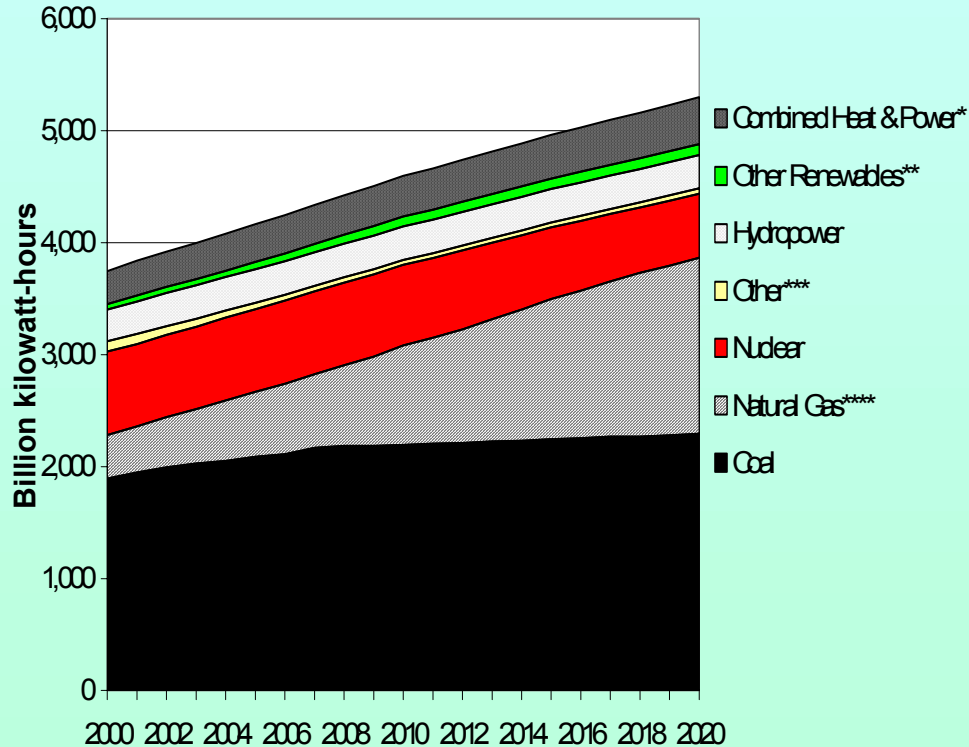


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Electricity generation

Clean Energy Blueprint vs. Business as Usual

Electricity Generation under
Business as Usual



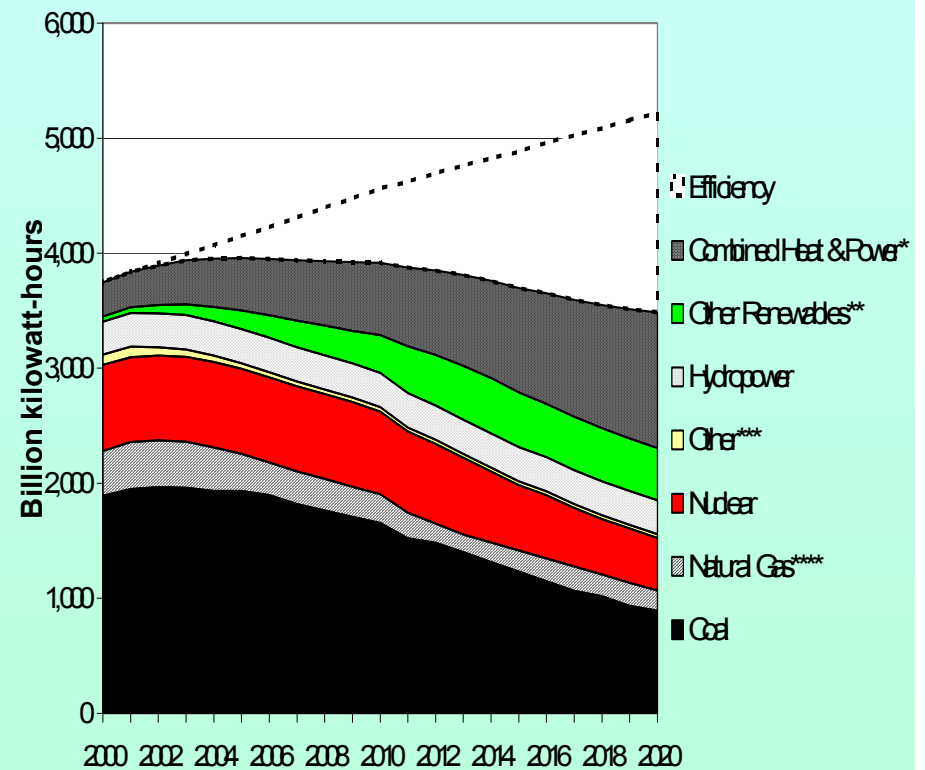
*Over 71% of C-H-P generation comes from natural gas in 2020.

**Includes wind, biomass, geothermal, solar, and landfill gas.

***Includes oil, municipal solid waste, and other wastes.

****Only includes stand-alone central station plants

Electricity Generation and Efficiency under the
Clean Energy Blueprint



*Over 91% of C-H-P generation comes from natural gas in 2020.

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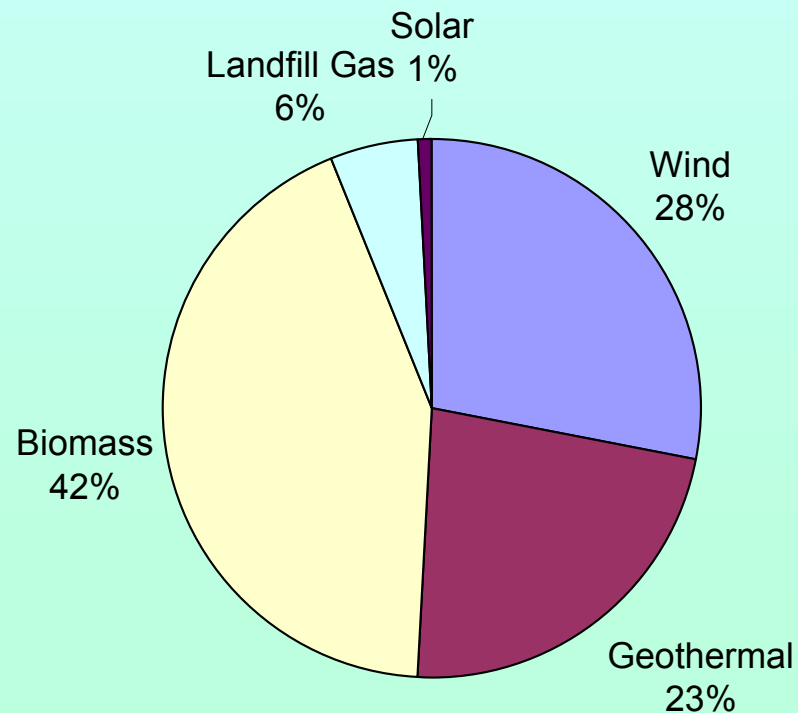
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Renewable energy generation

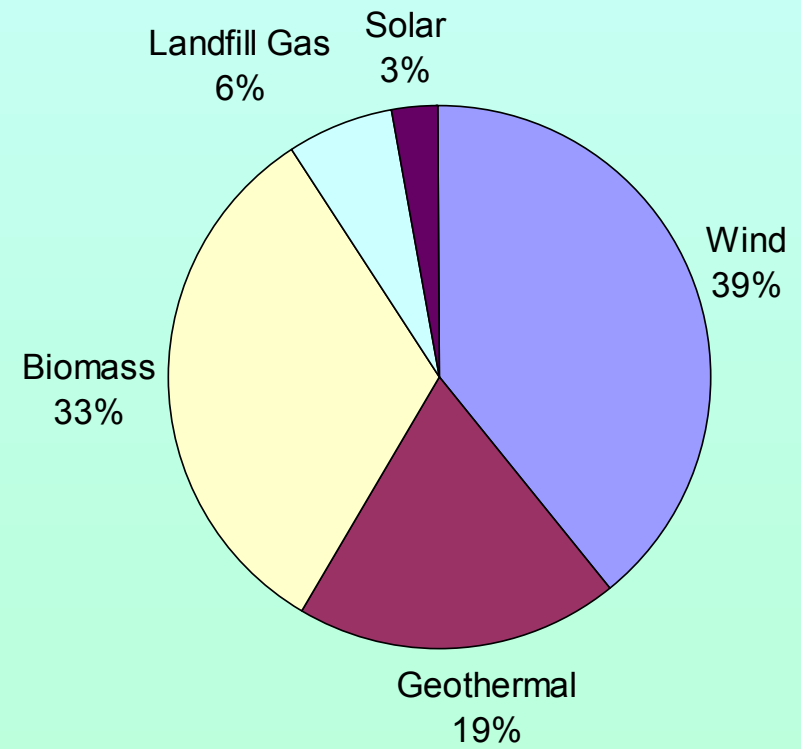
Clean Energy Blueprint



2010



2020

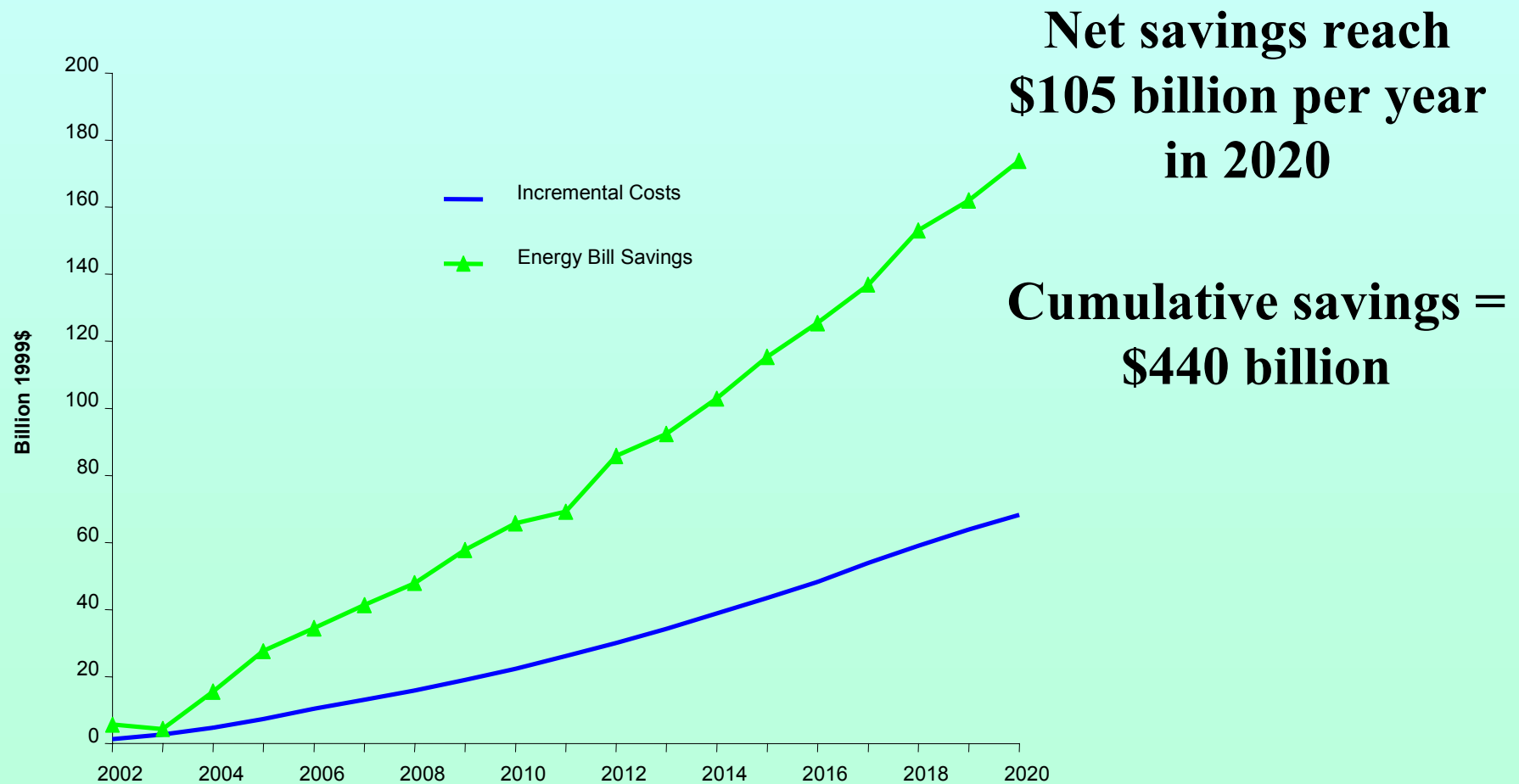




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Investment costs and energy bill savings

Clean Energy Blueprint

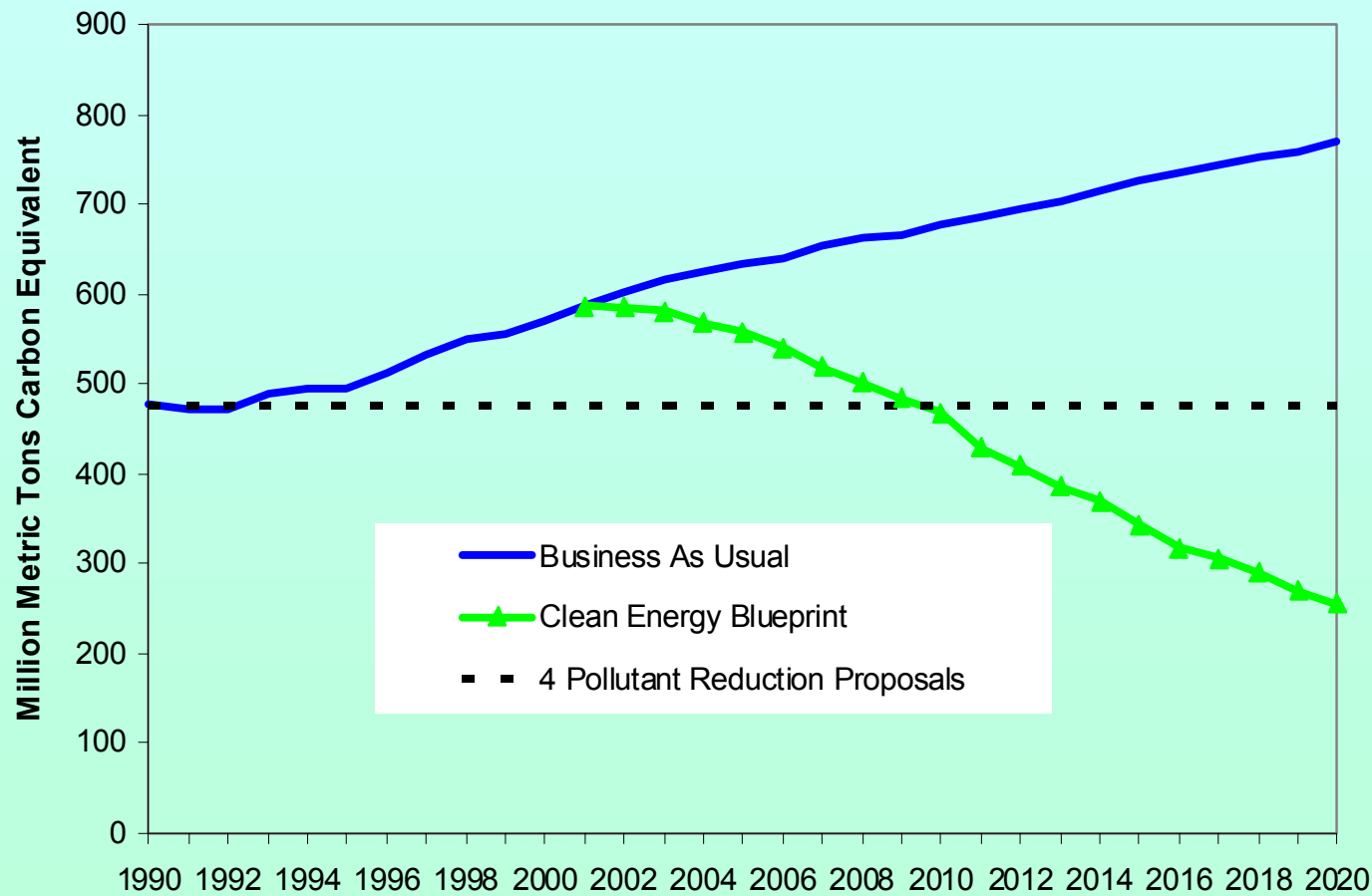




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Power plant carbon emissions

Clean Energy Blueprint



**CO₂ reduced
60% from
business as
usual**



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Energy security and environmental benefits **Reduction in vulnerable facilities**

- ✚ Avoids 975 new power plants (@300 MW)
- ✚ 30% reduction in natural gas use from business as usual (though 8% higher than today)
- ✚ Retires 180 dirty coal plants (@500 MW)
- ✚ 60% reduction in coal
- ✚ Retires 14 nuclear plants (@1,000 MW)
- ✚ Reduces need for thousands of miles of new gas pipelines



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Employment and income benefits **5% of US electricity from wind**



⌘ **More than \$60 billion in economic development**

⌘ **At least \$1.2 billion in new income for farmers**
– over \$2,000 per turbine

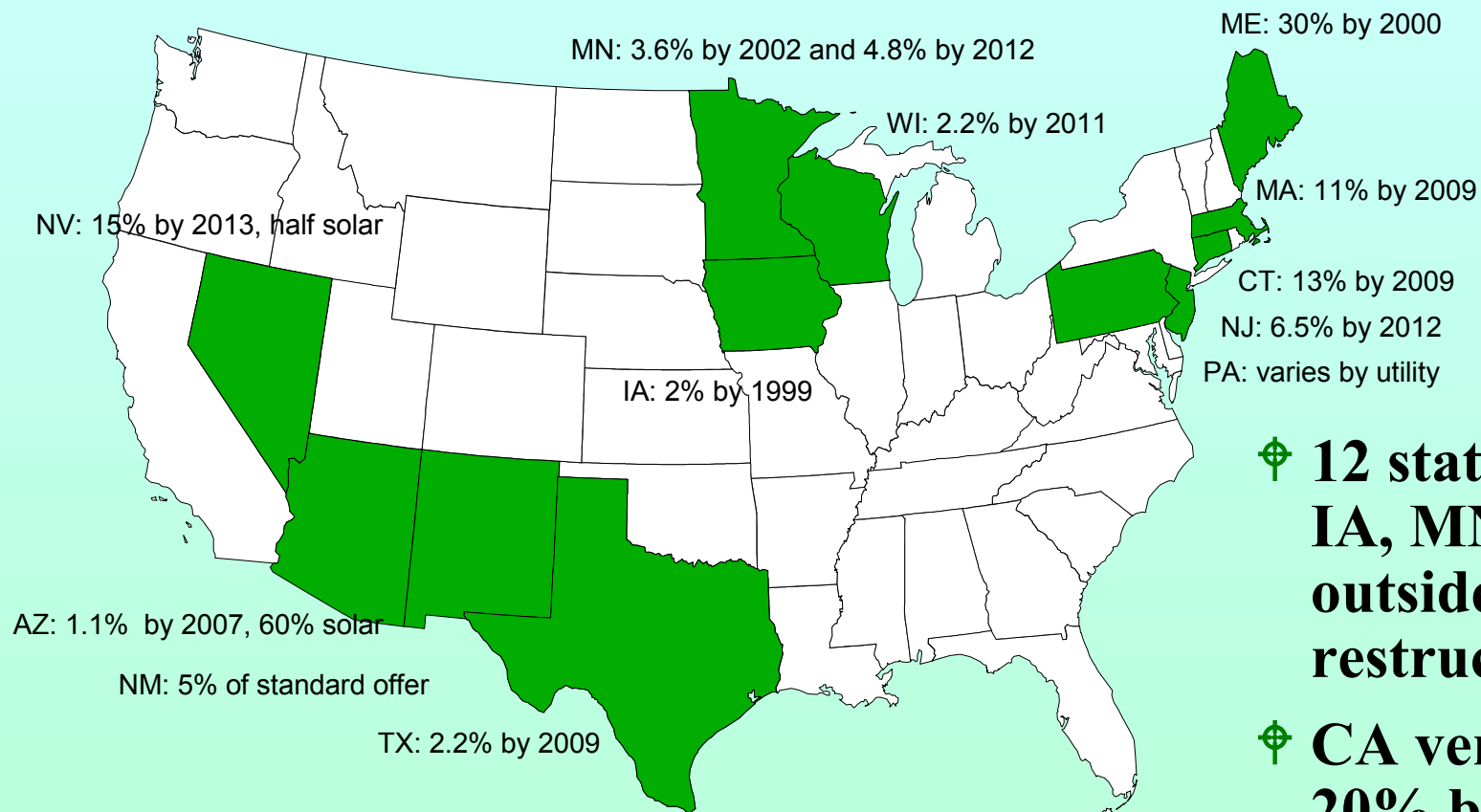
⌘ **At least 80,000 new jobs**

Source: US DOE



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Renewable energy standards



⊕ **12 states - WI, IA, MN, NV outside of restructuring**

⊕ **CA very close - 20% by 2010**

⊕ **NH, VT, RI??**



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energy
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